LAB 4: Decision Making

OBJECT
To study programming control constructions used for decision making in C.

THEORY
In C, a program may require a logical test on the basis of which the program statement will execute. This decision is based on the truth or falsity of a statement called as *Condition*.

There are three major decision making structures the if statement, if-else statement and switch case. In continuation of these structures, we shall also see a decision making operator called as *conditional operator* (? :).

The *if* Statement:

The if statement enables you to test for a condition (such as whether two variables are equal) and branch to different parts of your code, depending on the result or the conditions with relational and logical operators. The simplest form of if statement is:

if (expression)
statement;

In this form, the *statement* will be executed only if the *expression* is evaluated to a non zero value (i.e. if the expression is true).

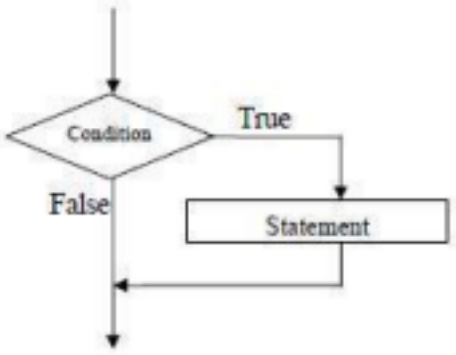

Fig: If statement flow chart

```
/* if statement */
void main(void)
{

    int number =
    5; int guess;
    clrscr();
    printf("I am thinking of a number between 1
    and 10\n"); printf("Enter your guess, please
    \n"); scanf("%d",&guess);
    if (guess == number)
    {
        printf("Incredible, you are correct\n");
    }

    getche();
}
```

The "= =" is called a relational operator. Relational operators, ==, !-, >, >=, <, and <=, are used to compare two operands. The program works, but it needs some improvements. If the user enters 5 as a choice, he gets back a nice message, "Incredible, you are correct". But what happens if the user puts in an incorrect choice? Nothing. No message, no suggestions, nothing.

The if-else Statement:

The *if* single-selection statement performs an indicated action only when the condition is true; otherwise the action is skipped. The if-else double-selection statement allows the programmer to specify an action to perform when the condition is true and a different action to perform when the condition is false. The simplest form of if-else statement is:

if (expression)
{
  statements;
}
else
{

statements;
}

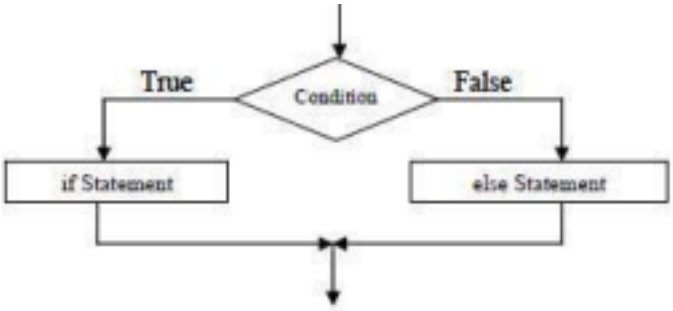

 Fig: if else flow control

An Example:

```
/* if-else */ void
main (void) /* Defining main function*/
 {
    int grade;
    clrscr(); /* Clears previous contents
    of screen*/ printf( Enter your grade );
    scanf( %d ,&grade);
    if ( grade >= 60 )
    printf("Passed");
    else
    printf("Failed");
    getch();
 }
```

Another example of the if else statement is:

```
/*if..else */
 void main(void)
 {

     int number =
     5; int guess;
     clrscr();
     printf("I am thinking of a number between 1
     and 10\n"); printf("Enter your guess,
     please\n"); scanf("%d",&guess);
     if (guess == number)
     {
```

```
        printf("Incredible, you are correct\n");
    }
   else
    {
        printf("Sorry, try again\n");
    }
    getch();
}
```

EXERCISE

1. Write a program using if else if statements that gets an operator(+,-,*,/) and two operands (num1,num2) from the user and depending on the operator entered perform the operation.

Answer:

```
#include <stdio.h>


int main() {

    char operator;

    float num1, num2, result;


    // Taking input from the user

    printf("Enter an operator (+, -, *, /): ");

    scanf(" %c", &operator);

    printf("Enter two numbers: ");

    scanf("%f %f", &num1, &num2);


    // Decision making using if-else-if

    if (operator == '+') {

        result = num1 + num2;

    }
```

```
    else if (operator == '-') {
        result = num1 - num2;
    }
    else if (operator == '*') {
        result = num1 * num2;
    }
    else if (operator == '/') {
        if (num2 != 0) {
            result = num1 / num2;
        } else {
            printf("Error! Division by zero is not allowed.\n");
            return 1;
        }
    }
    else {
        printf("Invalid operator!\n");
        return 1;
    }

    // Display result
    printf("Result: %.2f\n", result);
    return 0;
}
```

2. Write a mark sheet program using if else if statements that gets marks of five subjects from the user, calculates percentage and grade obtained by the user.

Answer:

```
#include <stdio.h>


int main() {

    float subject1, subject2, subject3, subject4, subject5, total, percentage;

    char grade;


    // Taking marks input

    printf("Enter marks for 5 subjects: ");

    scanf("%f %f %f %f %f", &subject1, &subject2, &subject3, &subject4, &subject5);


    // Calculating total and percentage

    total = subject1 + subject2 + subject3 + subject4 + subject5;

    percentage = (total / 500) * 100;


    // Assigning grades

    if (percentage >= 90) {

        grade = 'A';

    } else if (percentage >= 80) {
```

```
        grade = 'B';
    } else if (percentage >= 70) {
        grade = 'C';
    } else if (percentage >= 60) {
        grade = 'D';
    } else {
        grade = 'F';
    }

    // Displaying results
    printf("Total Marks: %.2f\n", total);
    printf("Percentage: %.2f%%\n", percentage);
    printf("Grade: %c\n", grade);

    return 0;
}
```

3. Write a program using if else statement that input your age and display your age group e.g, young or old accordingly.

Answer:

```
#include <stdio.h>
```

```
int main() {
    int age;

    // Taking age input
    printf("Enter your age: ");
    scanf("%d", &age);
    // Classifying age groups
    if (age < 13) {
        printf("You are a Child.\n");
    } else if (age >= 13 && age <= 19) {
        printf("You are a Teenager.\n");
    } else if (age >= 20 && age <= 40) {
        printf("You are an Adult.\n");
    } else if (age > 40 && age <= 60) {
        printf("You are Middle-aged.\n");
    } else {
        printf("You are a Senior Citizen.\n");
    }
    return 0;
}
```

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